

Application No. 10/710,004
Docket No. A4-1787
Amendment dated January 20, 2006
Reply to Office Action of October 20, 2005

REMARKS

In the Office Action, the Examiner reviewed claims 1-33 of the above-identified US Patent Application, with the result that all of the claims were rejected under 35 USC §103 as being obvious over U.S. Patent No. 3,392,527 to Gilmour Jr. et al. (Gilmour) in view of U.S. Patent No. 4,585,191 to Blount. In response, Applicant has amended the claims as set forth above. More particularly:

Independent product claim 1 and independent method claim 21 have been amended to recite that the energy beams (18) are emitted directly at the targets (16), as shown in Figures 1-7.

Claim 4 (which depends from claim 1) has been amended to cancel a limitation that has been reintroduced with new dependent claim 34 (which also depends from claim 1).

Claim 15 has been rewritten in independent form by incorporating all of the limitations of its parent claim 1 as originally filed. Claim 15 has been amended to further require that at least some of the surfaces of the targets (16) are curve-shaped such that some of the material (22) ablated from each of the targets (16) travels away from the emitting means (14) from which the impacting energy beam (18) is emitted. Support for these additional limitations

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can be found in claim 4 and in Applicant's specification at paragraph [0024].¹

Claim 22 (which depends from claim 21) has been amended to further include the additional/alternative step of adjustably aiming at least one source (14) of the energy beams (18) on a curved surface of at least one of the targets (16) to prevent at least some of the ablated material (22) deflected by the target (16) from collecting on the source (14). Support for this additional limitation can be found in Applicant's specification at paragraph [0024].

Claim 27 (which depends from claim 21) as been amended to correct a typographical error.

New claim 34 (which depends from claim 1) has been presented to recite the limitation canceled from claim 4 as noted above, and to further require that at least some of the surfaces of the targets (16) are curve-shaped, as described in Applicant's specification at paragraph [0024] and shown in Figures 1-7.

New claim 35 (which depends from claim 1) has been presented to recite that at least one of the targets (16) is impacted by multiple energy beams

¹ All references to pages and paragraphs in Applicant's electronically-filed application are those inserted by the USPTO authoring software.

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(18), as shown in Figures 6 and 7.²

New claim 36 (which depends from claim 35) has been presented to recite that the surface of the at least one target is curve-shaped. As noted previously, this limitation finds support in Applicant's specification at paragraph [0024] and Figures 1-7.

New claim 37 (which depends from claim 4) has been presented to recite that the "controlling means" of claim 4 comprises means (28,34) for adjustably aiming the energy beams (18) at the curve-shaped surfaces of the targets (16). Support for this limitation can be found in claim 10 and Applicant's specification at paragraph [0024].

New claim 38 (which depends from claim 4) has been presented to recite that the "controlling means" of claim 4 comprises shutters (46,48,50). Support for this limitation can be found in claim 22, Applicant's specification at paragraph [0024], and Figures 9-11.

Applicant believes that the above amendments do not present new matter. Favorable reconsideration and allowance of claims 1-38 are respectfully requested in view of the above amendments and the following

² According to MPEP §2163 II.A.3(a), "drawings alone may provide a 'written description' of an invention as required by [35 USC §112, first paragraph]," and "[i]n those instances where a visual representation can flesh out words, drawings may be used in the same manner and with the same limitations as the specification." (Citations omitted).

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remarks.

Rejection under 35 USC §103

As noted above, independent claims 1 and 21 and their respective dependent claims 4-20 and 22-33 were rejected as being unpatentable over Gilmour in view of Blount. Because claim 15 has been rewritten as an independent claim, the following will focus on the scope of claim 15 as well as claims 1 and 21.

Applicant's independent claims 1, 15, and 21 require an apparatus/process in which translation and rotation motion are selectively induced in a zero or low-gravity environment through means (14) that emit energy beams (18), targets (16) impacted by the energy beams (18), and means (26) for causing cooperation among the emitting means (14) and targets (16) to cause ablation of the targets (14) by the energy beams (18). Either or both the targets (16) and emitting means (14) are mounted to support means (20) extending from a structure (10) so as to be positioned apart from the structure (10). The apparatus and method of claims 1 and 21 further require that the energy beams (18) are emitted directly at surfaces of the targets (16). The apparatus of claim 15 further requires that the causing means (26) comprises means (28) for adjustably aiming the emitting means

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(14), and that at least some of the surfaces of the targets (16) are curve-shaped such that some of the ablated material (22) from each target travels away from the emitting means (14) from which the impacting energy beam (18) is emitted.

In contrast to Applicant's independent claims 1 and 21, the energy beam 14 employed by Gilmour's apparatus and process is not emitted directly at the surface 15 of the target 10, but instead must be reflected by a mirror 12 in order to adequately focus the energy beam 14 (see column 1, lines 49-57). Furthermore, and in contrast to Applicant's independent claim 15, Gilmour's apparatus and process do not entail any means for adjustably aiming the laser 11 at the target 10 (i.e., the laser 11 and mirror 12 are not disclosed as being controllably movable relative to each other) and the surface 15 of Gilmour's target 10 is not curve-shaped. Regarding the former limitation, any adjustment to the aim of Gilmour's laser 11 would disrupt the focus of the beam 14 on the end of the target 10, thus also undesirably necessitating repositioning of target 10 and mirror 12. Regarding the latter limitation, any modification of Gilmour's target 10 to have a curved surface would result in dispersion of the plasma 16, reducing the thrust of the plasma 16 and undesirably resulting in contamination of the mirror 12.

While Blount places thrust modules "A" at extremities of spars 20, the

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helium gas discharged from the thrust modules A is not emitted, directly or indirectly, at any target and there is no suggestion in Blount for adjustably aiming the thrust modules A. Furthermore, there appears to be no benefit to adjusting the aim of Blount's thrust modules A, since the fixed positions of the modules A already provide complete attitude and drag control of Blount's vehicle 10 (see column 3, lines 39-63). As such, Applicant believes that modifying Gilmour's teachings with those of Blount would not yield or suggest Applicant's invention as recited in any of independent claims 1, 15, and 21.

Specific to claim 4, neither Gilmour nor Blount discloses a target shaped such that material ablated therefrom by a beam travels toward the device that emitted the beam, and that means are provided for controlling the amount of the material that collects on the emitting device.

Specific to claim 9, neither Gilmour nor Blount discloses the use of mineral or ceramic materials as the target.

Specific to claims 10 and 28-31 and new claim 37, neither Gilmour nor Blount discloses or suggests adjustably aiming an energy beam at a target (for the reasons set forth in the above comments to claim 15).

Specific to claim 14, neither Gilmour nor Blount discloses targets mounted to support means adjacent energy beam sources but impacted by energy beams emitted by energy beam sources on different support means.

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Specific to claims 18 and 31, neither Gilmour nor Blount discloses anything regarding an adaptive learning algorithm to produce modified position, alignment, or attitude data, and communicating the modified position, alignment, or attitude data to a controlling means.

Specific to new claims 34-38, neither Gilmour nor Blount discloses anything regarding a target with a curve-shaped surface impacted by an energy beam (claims 34 and 36), or impacting a target with multiple energy beams (claim 35), or protecting an energy beam source by adjusting the aim of the source or using shutters.

For all of the above reasons, Applicant respectfully requests withdrawal of the rejection under 35 USC §103(a).


Closing

In view of the above, Applicant believes that the pending claims define patentable novelty over all the references, alone or in combination, of record. It is therefore respectfully requested that this patent application be given favorable reconsideration.

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Should the Examiner have any questions with respect to any matter
now of record, Applicant's representative may be reached at (219) 462-4999.

Respectfully submitted,

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